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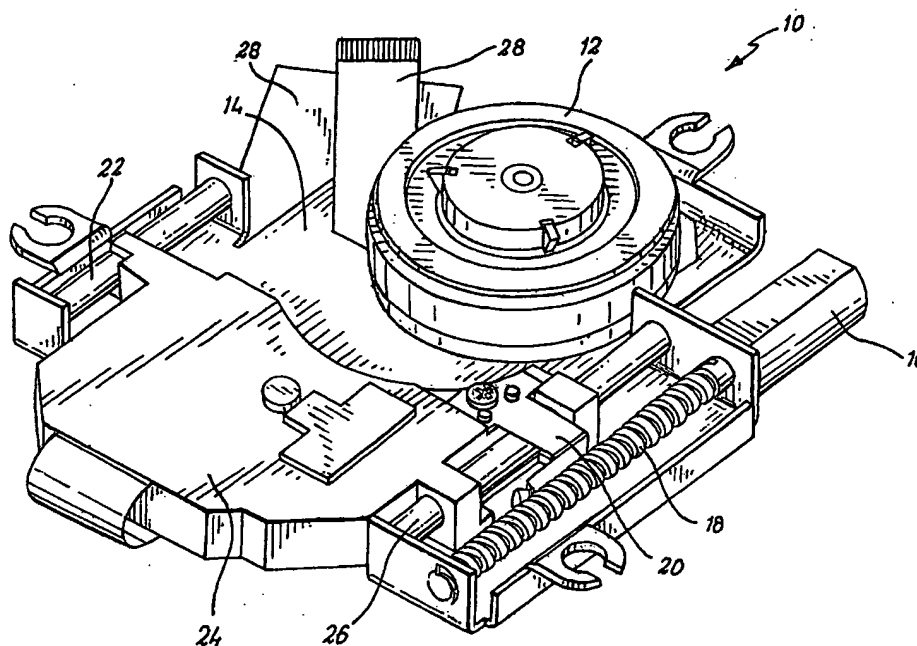
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(54) Title: **SINGLE PIECE OPTICAL MECHANICAL ASSEMBLY FOR OPTICAL DATA STORAGE ENGINES**



(57) Abstract: The invention provides an Optical Mechanical Assembly (OMA) for use in a portable optical data storage device, having a single piece chassis with mounting means for mounting components of the portable optical storage device. The chassis mounting means can mount the windings of the disc spindle motor, the control circuit of the disc spindle motor and the motor shaft of the disc spindle motor. The invention provides improvements to the drive design, which can reduce cost, improve tolerancing and build time.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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1 Single piece Optical Mechanical Assembly for optical data
2 storage engines

3

4 The present invention relates to recordable / re-writable
5 optical storage technology, especially portable CD and
6 DVD drives. In particular, the invention relates to
7 mechanical improvements to the drive design, which can
8 reduce cost, improve tolerancing and build time.

9

10 The basis for nearly all optical data storage systems to
11 date has been the Compact Disc format proposed by Philips
12 and Sony, some 20 years ago. This standard has been
13 modified from the original audio storage, to include data
14 of all formats, and also Recordable / re-writable
15 versions. The CD has become a familiar standard, and the
16 flexibility has lead to an increasing variety of uses.
17 The creation of DVD over the last few years has expanded
18 the capacity of optical data storage available to the
19 consumer, whilst maintaining a familiar look and feel. In
20 particular, growth has been seen in portable solutions,
21 and these portable solutions have specific requirements
22 separate from the needs of a PC based solution. The needs
23 of a portable solution include small size, and improved

1 power consumption. Additionally portable optical data
2 storage solutions can often be directed more towards the
3 consumer electronic environment, which has very tight
4 cost restrictions.

5
6 An optical data storage device consists of a number of
7 sections which can be divided into mechanical, electronic
8 and firmware. Historically Optical Mechanical Assemblies
9 (OMA) for use in CD, CDRW, DVD and recordable DVD drives
10 require a chassis which has location features to mount
11 the guide rail and the leadscrew (for location of the
12 Optical Pick Up (OPU) reading / recording head), the sled
13 motor which traverses the OPU across the data area of the
14 disc and the spindle motor for spinning the disc. The
15 spindle motor typically is purchased from a specialised
16 motor supplier who would supply the motor with a mounting
17 plate for attachment to the chassis via screws. Typically
18 in portable optical data storage systems, a scaled down
19 version of the OMA used in non-portable applications,
20 such as PC CD drives etc, is created. Designs are known
21 that have enabled the integration of the OMA unit within
22 the drive body thus reducing some component count and
23 tolerancing. However, the integrated OMA still required a
24 separate motor assembly and sled drive system, and was
25 suitable for a complete product design only, rather than
26 an "engine" solution for use in a wide variety of
27 products.

28

29 It is an object of the present invention to provide an
30 improved chassis for the Optical Mechanical Assembly for
31 an optical data storage device.

32

1 According to a first aspect of the present invention
2 there is provided an Optical Mechanical Assembly (OMA)
3 for use in a portable optical data storage device,
4 comprising a single piece chassis having mounting means
5 for mounting components of the portable optical storage
6 device thereon.

7
8 Preferably said mounting means is a mounting plate for
9 the motor shaft of the disc spindle motor.

10
11 Preferably said mounting means is a mounting plate for
12 the windings of the disc spindle motor.

13
14 Preferably said mounting means is a mounting plate for
15 the control circuit of the disc spindle motor.

16
17 Preferably the chassis is made from metal.

18
19 Preferably said mounting means is the mounting plate for
20 the sled motor.

21
22 Preferably said mounting means is the mounting plate for
23 the drive system.

24
25 Preferably said mounting means is the mounting plate for
26 the leadscrew.

27
28 Preferably said mounting means is the mounting plate for
29 a first guide rail.

30
31 Preferably, a sled motor is attached to said mounting
32 plate, the sled motor being driven onto the leadscrew via
33 a gearbox assembly.

1
2 Alternatively, a sled motor is attached to said mounting
3 plate, the sled motor being driven directly from a
4 stepper motor onto the leadscrew.

5
6 Preferably a second guide rail is mounted on the chassis
7 and the sled motor driven from the leadscrew acts on the
8 OPU via this second guide rail via a cam. This reduces
9 vibrational susceptibility.

10
11 Preferably screws are used to allow for OPU tilt
12 adjustment. Preferably the screws are mounted on both
13 ends of the first guide rail, and one end of the
14 leadscrew.

15
16 Preferably there are three screws.

17
18 Optionally the screws are mounted on both ends of the
19 leadscrew and one end of the first guide rail.

20
21 Preferably the screws are mounted on both ends of one of
22 the first or second guide rails, and one end of the other
23 to allow for OPU tilt adjustment.

24
25 Preferably the screws are spring mounted.

26
27 In order to provide a better understanding of the present
28 invention, an embodiment will now be described by way of
29 example only and with reference to the accompanying
30 Figures, in which:

31

1 Figure 1 illustrates, in schematic form an optical
2 mechanical assembly, in accordance with a preferred
3 embodiment of the present invention; and

4

5 Figure 2 illustrates, in schematic form a conventional
6 optical mechanical assembly.

7

8 The present invention is an OMA chassis that is
9 manufactured from a single piece of material. This
10 chassis replaces the spindle motor base plate, and
11 preferably the mounting for the sled motor, and may
12 contain locators for the leadscrew and guide rail.

13

14 With reference to Figure 1, the OMA 10 incorporates the
15 metal mounting plate 14 of the motor 12 into the metal
16 chassis plate 14 of the OMA. The metal part of the
17 chassis is thus manufactured with an additional area
18 where the motor is sited. The chassis plate then has the
19 motor shaft, windings and control circuit mounted to it
20 directly thus combining the motor plate and the chassis.
21 Rigid materials other than metal may be used.

22

23 The chassis also acts as the mounting plate for the sled
24 motor 16 and drive system and as the mounting for the
25 leadscrew 18 that moves the drive cam 20.

26

27 The chassis also acts as the mounting plate for the guide
28 rail 22 required for the Optical PickUp (OPU) 24.

29

30 The OPU sled motor motion may be driven onto the
31 leadscrew via a gearbox assembly.

32

1 The sled motor motion may be driven directly from a
2 stepper motor onto the leadscrew.

3

4 An additional guide rail 26 is mounted and the sled drive
5 from the lead screw acts on the OPU via this additional
6 guide rail using the cam, thus reducing vibrational
7 susceptibility.

8

9 Three spring mounted screws are used to allow for OPU
10 tilt adjustment. The three screws may be mounted on
11 either end of the guide rail, and one end of the
12 leadscrew. Alternatively the three screws may be mounted
13 either end of the leadscrew and one end of the guide
14 rail. The three spring mounted screws are used to allow
15 for OPU tilt adjustment. The three screws may be mounted
16 on either end of one of the guide rails, and one end of
17 the other.

18

19 Flex connectors 28 are also shown.

20

21 With reference to Figure 2, that shows a conventional OMA
22 30 for use in CD, CDRW, DVD and recordable DVD drives,
23 the OMA incorporates a chassis 32 which has location
24 features to mount the guide rail 34, the leadscrew 36 for
25 location of the Optical Pick Up (OPU) 38 reading /
26 recording head, the sled motor 40 and gear train 42 which
27 traverses the OPU across the data area of the disc and
28 the spindle motor 44 for spinning the disc. The leadscrew
29 provides drive to the OPU, and the motion is transferred
30 via the use of a cam 46. The spindle motor comprises a
31 mounting plate 48 for attachment to the chassis using
32 screws. Flex connectors 50 are also shown.

33

1 The advantages of the present invention are a reduction
2 in the overall size of the OMA, as well as a subsequent
3 reduction in the part count and hence overall cost. The
4 present invention also has the effect of improving the
5 tolerancing of the OMA and in particular the location of
6 the lead screw and guide rail (or both guide rails, if
7 two are used), which has the effect of improving tilt
8 performance. The improved tilt performance is critical to
9 the success of optical engine solutions, and in
10 particular recording solutions. Improvement in tilt will
11 result in reduced manufacturing time for the OMA and also
12 reduce the risk in the design stage. A further advantage
13 of using the present invention is the increase in
14 stability and rigidity of the OMA due to the single piece
15 construction and cross support between the guide rail and
16 leadscrew. The increase in rigidity and stability will
17 improve the OMA performance, particularly at high speed
18 operation.

19

20 Further modifications and improvements may be added
21 without departing from the scope of the invention herein
22 described.

1 Claims

2

3 1. An Optical Mechanical Assembly (OMA) for use in a
4 portable optical data storage device, comprising a single
5 piece chassis.

6

7 2. An Optical Mechanical Assembly as claimed in claim 1
8 having mounting means for mounting components of the
9 portable optical storage device thereon.

10

11 3. An Optical Mechanical Assembly as claimed in claim 2
12 wherein, said mounting means is a mounting plate for the
13 motor shaft of the disc spindle motor.

14

15 4. An Optical Mechanical Assembly as claimed in claim 2
16 or claim 3 wherein, said mounting means is a mounting
17 plate for the windings of the disc spindle motor.

18

19 5. An Optical Mechanical Assembly as claimed in any one
20 of claims 2 to 4 wherein, said mounting means is a
21 mounting plate for the control circuit of the disc
22 spindle motor.

23

24 6. An Optical Mechanical Assembly as claimed in any one
25 of claims 2 to 5 wherein, the chassis is made from metal.

26

27 7. An Optical Mechanical Assembly as claimed in any one
28 of claims 2 to 6 wherein, said mounting means is the
29 mounting plate for the sled motor.

30

31 8. An Optical Mechanical Assembly as claimed in any one
32 of claims 2 to 7 wherein, said mounting means is the
33 mounting plate for the drive system.

1

2 9. An Optical Mechanical Assembly as claimed in any one
3 of claims 2 to 8 wherein said mounting means is the
4 mounting plate for the leadscrew.

5

6 10. An Optical Mechanical Assembly as claimed in any one
7 of claims 2 to 9 wherein, said mounting means is the
8 mounting plate for a first guide rail.

9

10 11. An Optical Mechanical Assembly as claimed in any one
11 of claims 2 to 10 wherein, a sled motor is attached to
12 said mounting plate, the sled motor being driven onto the
13 leadscrew via a gearbox assembly.

14

15 12. An Optical Mechanical Assembly as claimed in any one
16 of claims 2 to 10 wherein, a sled motor is attached to
17 said mounting plate, the sled motor being driven directly
18 from a stepper motor onto the leadscrew.

19

20 13. An Optical Mechanical Assembly as claimed in any one
21 of claims 1 to 12 wherein, a second guide rail is mounted
22 on the chassis and the sled motor driven from the
23 leadscrew acts on the OPU via this second guide rail via
24 a cam. This reduces vibrational susceptibility.

25

26 14. An Optical Mechanical Assembly as claimed in any one
27 of claims 1 to 13 wherein, screws are used to allow for
28 OPU tilt adjustment.

29

30 15. An Optical Mechanical Assembly as claimed in claim
31 14 wherein, the screws are mounted on both ends of the
32 first guide rail, and one end of the leadscrew.

33

1 16. An Optical Mechanical Assembly as claimed in any one
2 of claims 14 or 15 wherein there are three screws.

3

4 17. An Optical Mechanical Assembly as claimed in any one
5 of claims 14 to 16 wherein, the screws are mounted on
6 both ends of the leadscrew and one end of the first guide
7 rail.

8

9 18. An Optical Mechanical Assembly as claimed in any one
10 of claims 14 to 17 wherein, the screws are mounted on
11 both ends of one of the first or second guide rails, and
12 one end of the other to allow for OPU tilt adjustment.

13

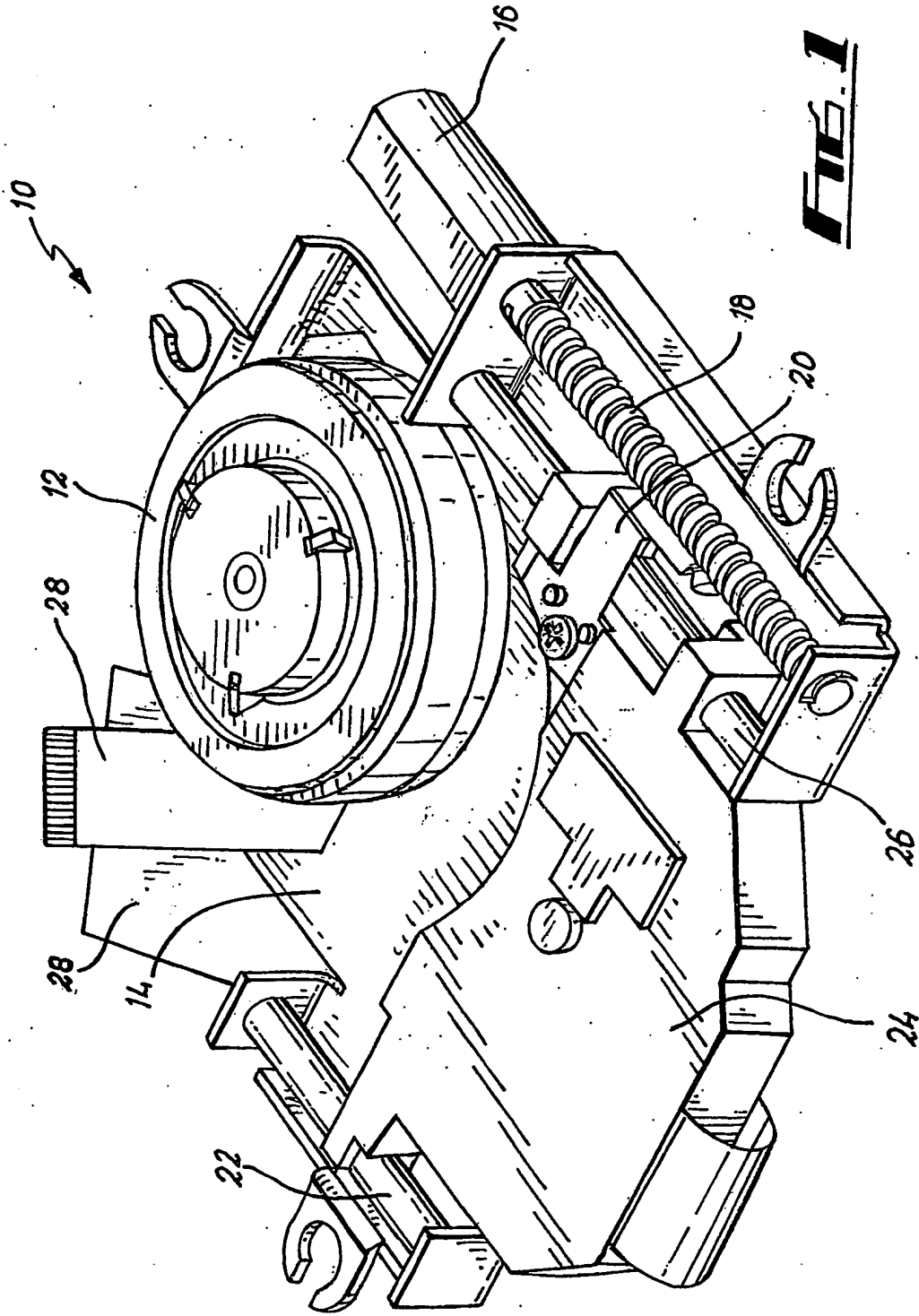
14 19. An Optical Mechanical Assembly as claimed in any one
15 of claims 14 to 18 wherein, the screws are spring
16 mounted.

17

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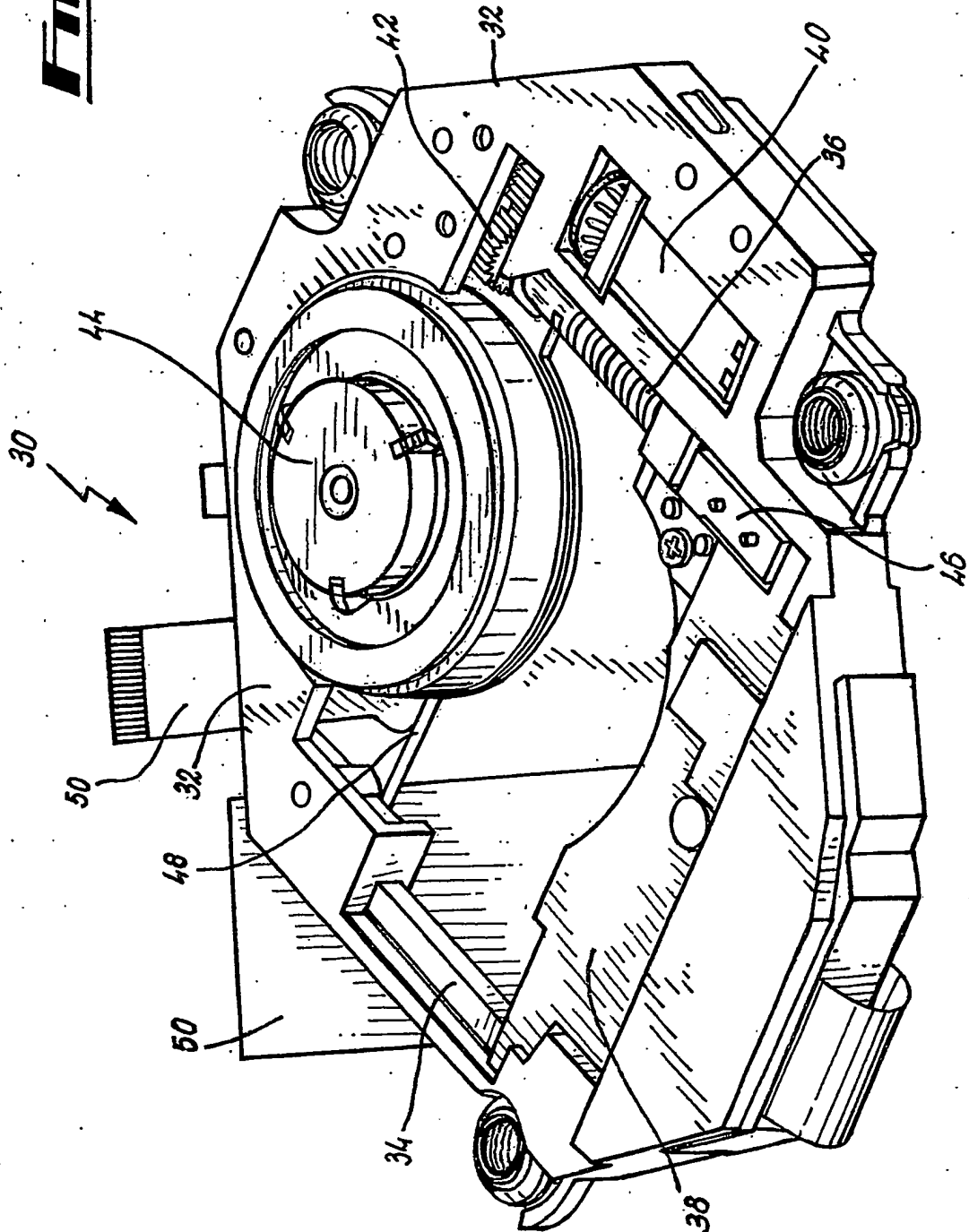
FIG. 1



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FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 03/05722

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G11B7/085 G11B17/00 G11B7/09

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

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☒ Further documents are listed in the continuation of box C.

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